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WHAT IS THE ORIGIN OF THE NAME "ROLLE'S CURVE"?

By FLORIAN CAJORI, University of California.

It is a curious circumstance that the two topics of mathematical interest for which Michael Rolle is now best known—"Rolle's theorem" and "Rolle's curve" —are the ones which modern readers have been experiencing difficulty in finding in Rolle's published books or articles and in legitimately associating with his name. As late as 1903 A. v. Braunmühl[1] declared that "Rolle's theorem"—the theorem according to which $f'(x) = 0$ has at least one real root lying between two successive real roots of $f(x) = 0$—had not been found in Rolle's works and was therefore wrongly attributed to him. The present writer[2] was finally able to show that the theorem is rightly attributed to Rolle, it being found in an out-of-the-way publication of Rolle bearing the title *Démonstration d'une Methode pour résoudre les Egalitez de tous les degrez*, Paris, 1691.

As regards "Rolle's curve," historians have been thus far less fortunate. Some years ago Gino Loria[3] frankly admitted that he had not been able to ascertain the reason why the cubic curve $xy^2 = a(y + x)^2$ or $xy^2 = a(y - mx)^2$ should be named after Rolle. F. G. Teixeira[4] speaks of "Rolle's curve" and fully describes its properties, but gives no information as to Rolle's connection with the curve. Nor does Felix Müller,[5] who simply mentions its name. The earliest appearance that we have seen of this name in print is 1896, when Elgé[6] wrote an article "Sur la courbe de Rolle. Sa construction par points et par tangents."

In 1898 Gino Loria[7] published a note of inquiry regarding the origin of the name, and said that de Longchamps believed he had seen the name earlier in the *Educational Times*. As this note elicited no response, it was republished ten years later[8] with an annotation by H. Brocard who states that the discussion carried on between Saurin and Rolle on the "problème général des tangentes" in the *Journal des Savans* in the years 1702 and 1703 seemed to be a promising place for search, but that it is not given there; Brocard admits that he was not able to find any justification for attributing the curve to Rolle. No greater success rewarded the efforts of the present writer who examined the booklet quoted above, which contains "Rolle's theorem," also Rolle's *Traité d'Algebre*, Paris, 1690, and the different volumes of the *Histoire de l'Académie royale des*

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[1] A. v. Braunmühl in *Bibliotheca Mathematica*, 3. F., Vol. 4, p. 399.

[2] F. Cajori in *Bibliotheca Mathematica*, 3. F., Vol. 11, 1910–1911, pp. 300–313.

[3] G. Loria, *Spezielle algebraische und transcendente Ebene Kurven.* Deutsch v. F. Schütte, Leipzig, 1902, p. 75; 2d ed., 1910, p.78.

[4] F. G. Teixeira, *Traité des courbes spéciales remarquables planes et gauches*, in *Obras*, Vol. 4, Coimbra, 1908, pp. 115, 134.

[5] F. Müller, *Mathematisches Vokabularium*, Leipzig, 1900, "Curve." See also F. Müller in *Bibliotheca Mathematica*, 3. F., Vol. 2, 1901, p. 302.

[6] Elgé in *Journal de mathématiques spéciales*, 4 S., Vol. 5, 1896, pp. 32–34. See also p. 55.

[7] *L'Intermédiaire des mathématiciens*, Vol. 5, 1898, p. 76. No. 1257.

[8] *L'Intermédiaire des mathématiciens*, Vol. 16, 1908, p. 244.

sciences at Paris. The curve and its graph are given without name in Cramer's *Introduction à l'analyse des lignes courbes*, 1750, pp. 188, 478, and in O. Gherli's *Elementi teorico-pratici delle matematiche pure*, Vol. IV, Modena, 1773, pp. 343, 345.

The question still remains to be solved, who first used the name "Rolle's curve" for $xy^2 = a(y + x)^2$ and what connection, if any, Rolle had with it.[1] Who can throw further light on this?

THE MATHEMATICS OF AËRODYNAMICS.[2]

By EDWIN BIDWELL WILSON, Massachusetts Institute of Technology.

1. In the development of a branch of engineering there are several stages, sometimes long drawn out and poorly differentiated, sometimes brief and sharply defined.

There is the stage in which the bold inventors, trying one way and another, often with personal danger or even disaster, accomplish the first crude beginnings. In ship construction this epoch is prehistoric; in steam engineering it starts, at least in story, with Watts; in electrical engineering it lies within the memory of men still living; in aëronautics it stretches over a long period admirably described by A. F. Zahm in his book *Aërial Navigation.* The first essays in aëronautics, if we overlook the legendary Icarus, were the balloon and the balloon-type machine; progress with the heavier-than-air type may well be dated from Langley and the Wrights, though experiments with gliders are known for some time previous to them.

There is another stage—that in which the properly equipped mathematician and physicist construct a theory to correspond to the branch of engineering and by the indications of that theory aid materially in hastening the development of improved types of machines, or at least, if they arrive too late to help in the major development, they assist in codifying the fundamental scientific principles which underlie the subject and make possible systematic training of the youth to carry on the advance in details. The development of mathematics and physics was sufficient before the advent of electrical engineering to enable major advances to be made by William Thomson (later Lord Kelvin), by Oliver Heaviside, and by M. I. Pupin, to mention only three. In the case of the simpler parts of mechanical engineering and of naval architecture, the pressing necessities of prehistoric and early historic man were such that the art far outstripped the

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[1] As far as I now know, the only curve which prior to 1896 may be said to have been associated with the name of Rolle is mentioned by J. Bernoulli in a letter to Leibniz, dated May 7, 1701. Bernoulli there refers to the "ultima Rolii curva a Varignonio delineata

$$y = 2 + \sqrt{(4 + 2x)} + \sqrt{(4x)},"$$

Got. Gul. Leibnitii et Johan. Bernoullii Commercium Philosophicum et Mathematicum, Tomus secundus, Lausannæ & Genevæ, MDCCXLV, pp. 41, 42, 44.

[2] Address read before the Mathematical Association of America at its annual meeting, at Columbia University, New York, Saturday, December 30, 1916.